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H. H. KIMBALL, Librarian.

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—— Stewart über das Klima von Südafrika. P. 130.
—— Meteorologische Beobachtungen zu Lagos. P. 133.
—— Resultate der meteorologischen Beobachtungen zu Alt-Calabar im Jahre 1902. Pp. 133-134.
—— Prohaska: Ueber die jährliche und tägliche Periode der Gewitter und Hagelfälle in Steiermark, Kärnten und Krain. Pp. 134-137.
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—— Meteorologische Beobachtungen in Britisch Honduras 1904. P. 142.
—— Meteorologische Beobachtungen an der Goldküste. Pp. 142-143.

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THE OPPORTUNITIES OF THE WEATHER SERVICE.

The recall of Mr. Ashley from Hawaii to Pittsburg, while a promotion of an excellent man to one of the most responsible positions in the service, would, of course, not have been ordered had it not been for the opening made by the appointment of his predecessor, Mr. Ridgway, to the position of Commissioner of Public Safety of the city of Pittsburg. Mr. Ridgway has a lifelong record of sterling integrity, conscientious devotion to duty, and energetic ability in matters of usefulness. His case is one of the best examples of the development of a young man under the training and discipline that comes with the Weather Bureau service. Every Weather Bureau station is important, not only to the public, because of what we can do for it, but also to the observer in charge, because of what it can do for him. The stations offer innumerable opportunities to the observers to show their ability in perceiving and utilizing opportunities of usefulness to the community. The quicker a man is to see these chances, so much the surer is he to rise in the esteem of the people and of the Chief. We understand that Mr. Ridgway, from the date of taking charge at Pittsburg, devoted himself to mastering the situation as it then existed. The community came to have such confidence in his work, and such confidence in him as a man, that the new municipal administration has called him to an important public office at a large salary. Of course such public offices are not usually held by one person for many consecutive years, and we presume that Mr. Ridgway will eventually return to the Weather Bureau. Meantime we doubt not that his furlough will give him an opportunity to do a very important public work for the city of Pittsburg, and that the Weather Bureau will be proud of his career.—*C. A.*

DROUGHT AND ATMOSPHERIC ELECTRICITY.

The Chief of Bureau has received an interesting letter from Mr. W. de Ruyter van Steveninck, dated Curaçao, March 31, 1906, which may be summarized as follows:

The island of Curaçao is at latitude 12° north, longitude 69° west, and is occupied by over 50,000 inhabitants. It is 58 kilometers long, 11 to 3 kilometers broad, and is very hilly, the highest hills rising 1200 feet. It is generally said that the rainfall was much greater fifty years ago, which I ascribe to the fact that the trees then existing conducted the negative electricity of the earth to the positive electricity of the air, thereby causing fog or rain; but these trees have now perished, and rain is scarce. It is well known that the air is always positive and the earth always negative; that where there is lightning there is also rain, and that where there is rain there is also lightning; where the lightning is strong the rain is often luminous (voluminous?). There must exist a formula showing the relation between the vapor in the air and the atmospheric electricity.

Rain does not fall in tropical trade-wind regions unless the warm surface air is suddenly raised, either by impinging on a mountain slope, or by being pushed up over an advancing stream of cooler air near the ground, or by rapidly rising in very warm localities. But these ordinary natural methods of making rain sometimes fail to bring rain for months or years together. Such failures are not to be attributed to the cutting off of woodland, or to any recent changes in the surface of the ground. General droughts and rains result alike from very extensive changes in the so-called general circulation of the atmosphere, or changes in the general position of the great centers of high and low pressure. According as these oscillate several hundred miles either way, a locality such as Curaçao may be left one year in a region of rain, and another year in a region of drought. These changes are progressive and slow; the oscillations occupy at times ten, fifteen, or twenty years; when we understand these we shall be able to predict seasons of large or small rainfall, but that time is still far distant. We do not see how any known relation between rainfall and atmospheric electricity can be of much help even in suggesting rational methods of experimentation, but the importance of the subject is so great that we gladly commend the problem to the attention of physicists.

As to our knowledge of the connection between rain and electricity we must refer to the best general summary of our knowledge of atmospheric electricity given by Mr. George C. Simpson, in the Quarterly Journal of the Royal Meteorological Society, London, October, 1905. According to this summary the electrified condition of the atmosphere consists in the presence of ions, i. e., corpuscles, atoms, or possibly molecules, of some gas or vapor in the atmosphere, each of which carries an elemental charge of electricity. A neutral atom or molecule may be broken up into two smaller corpuscles or molecules, one of them charged positively, and the other negatively. If these smaller portions reunite they will again perfectly neutralize each other. If, however, most of the positive molecules collect in one region, and the negative in another, then those two regions are said to be respectively positively and negatively electrified, that is to say there is a preponderance of the positive and negative in the respective regions. Thus, observations show that there are more positive than negative ions in the air near the surface of the ground, or near the surfaces of objects resting on the ground. The ground itself usually has a negative charge, and this would seem to suggest a plausible explanation of the reason why there is a positive charge in the air near by. A body charged with negative electricity and located in the lower atmosphere loses this charge more rapidly than it would lose a corresponding charge of positive electricity. This rapid dissipation is apparently explained by the fact that there is an excess of positive ions in the lower atmosphere, and that these, coming in contact with the body, carry off or neutralize its negative electricity. The excess of positive ions in the lower air is probably explained by the fact that the negative earth attracts the positive ions toward it.

The fundamental problem in atmospheric electricity is to determine what forces are at work in the air to produce, or introduce, these positive and negative ions. The electrified condition of the air, and the dissipation of electricity from a charged body would not be possible without the presence of ions, and no ions can be produced without the action of some ionizer powerful enough to do the great work that is going on. Mr. Simpson enumerates five possible atmospheric ionizers.

1. *Ultraviolet light.*—The ionization produced by ultraviolet rays from the sun appears to be confined entirely to the highest strata of the atmosphere, and can only produce an appreciable effect in the lower atmosphere when that upper air descends to levels that are accessible to us, by which time, however, its electric condition may have been greatly modified.

2. *High temperature.*—When a gas is heated to a very high temperature a sudden ionization takes place. It is possible that in this way volcanic eruptions contribute a small fraction of one per cent to atmospheric electricity.

3. *Chemical processes.*—This is a possible method; thus the production of ozone in the air, especially at the high temperature of the lightning flash, may contribute something, but the relation between ozone and ionization is at present hypothetical.

4. *The Roentgen or X rays.*—These rays seem to be everywhere present to a feeble extent, traversing the atmosphere in all directions. Their ultimate origin is as yet unknown, but they have the power of producing an appreciable percentage of ionization.

5. *The Becquerel, or alpha, beta, and gamma rays, given off by radio-active bodies.*—The gamma rays are essentially the same as the X rays of the fourth item. The alpha and beta rays are very efficient ionizers.

(a) It is supposed that alpha and beta rays emanate from the sun, because by this hypothesis we may explain several geo-physical phenomena, such as the earth's magnetism, the aurora borealis, and the variations of these latter with sun spots and solar prominences. These rays from the sun must, however, be absorbed by the upper atmosphere, and do not satisfactorily explain the ionization observed in the lower atmosphere.

(b) There are innumerable substances, perhaps we may say practically all mineral substances found in the earth's crust, that are radio-active, and the total effect of radiations from these is to produce a very slight ionization in the lower regions of the atmosphere.